CLAIMS:

1. A method of diagnosing pathologic heart conditions comprising:

identifying a systolic sub-interval of a systolic interval for a plurality of heart cycles in a sequence of heart cycles;

computing an energy value for each systolic sub-interval;

computing a composite energy value using the computed energy values for each systolic sub-interval; and

comparing the composite energy value to a threshold level in order to distinguish between a normal heart and a pathologic heart.

2. A method of diagnosing pathologic heart conditions comprising:

filtering a time series of heart sounds;

parsing the time series of heart sounds into a sequence of individual heart cycles;

identifying a systolic interval for each heart cycle;

identifying a systolic sub-interval of the systolic interval for each heart cycle;

computing an energy value for the systolic sub-interval of one or more heart cycles, said energy value being proportional to the energy level associated with the filtered series of heart sounds;

computing a composite energy value for the systolic sub-intervals of one or more heart cycles; and

comparing the composite energy value to a threshold level in order to distinguish between a normal heart and a pathologic heart.

3. The method of claim 2 wherein said parsing step uses electro-cardiogram (ECG) data in order to transform a time series of heart sounds into a sequence of individual heart cycles.

4. The method of claim 2 wherein said parsing step uses acoustic heart sounds obtained directly from a patient in order to transform a time series of heart sounds into a sequence of individual heart cycles.

5. The method of claim 2 wherein identifying a systolic interval for each heart cycle is achieved by identifying pulses on an electro-cardiogram (ECG).

6. The method of claim 2 wherein identifying a systolic interval for each heart cycle is achieved by acoustically locating a first and a second heart sound using a bandpass filter, said bandpass filter applied to the time series of heart sounds.

7. The method of claim 2 wherein filtering the time series of heart sounds is achieved using a bandpass filter.

8. The method of claim 2 wherein filtering the time series of heart sounds is achieved using time-frequency transforms.

9. The method of claim 8 wherein the time-frequency transform is a wavelet transform.

10. The method of claim 8 wherein the time-frequency transform is a Fourier transform.

11. The method of claim 2 wherein the systolic sub-interval is centered in systole.

12. The method of claim 2 wherein the systolic sub-interval is centered in systole and is half of the systolic interval.

13. The method of claim 2 wherein the composite energy value is computed as the median of the computed energy values for more than one of the systolic sub-intervals of the heart cycles.

14. The method of claim 2 wherein the composite energy value is computed as the weighted average of more than one of the computed energy values for the systolic sub-intervals of the heart cycles.

15. The method of claim 2 wherein the composite energy value is computed as the median across more than one of the heart cycle systolic sub-intervals of a quantity proportional to energy.

16. The method of claim 2 wherein the composite energy value is computed as the weighted average energy value across more than one of the heart cycle systolic sub-intervals.

17. The method of claim 14 wherein the ratio of energies between systolic interval and diastolic interval are also used to distinguish a normal heart from a pathologic heart by prior statistical characterization of the ratio of energies between systolic interval and diastolic interval for normal and pathologic hearts.

18. The method of claim 14 wherein the standard deviation of the energy in a systolic interval is also used to distinguish a normal heart from a pathologic heart by prior statistical characterization of the standard deviation of the energy in a systolic interval for normal and pathologic hearts.

19. A system for diagnosing pathologic heart conditions comprising:
a portable computing device for:
managing data collection from new patients;
storing data; and
analyzing data,
and
a patient data collection unit for acquiring electro-cardiogram (ECG) and heart sound data from a patient, said patient data collection unit operatively connected with said portable computing device.

20. The system of claim 17 wherein the patient data collection unit comprises:
a contact microphone for obtaining acoustic data;

an acoustic pre-amplifier operatively connected with said contact microphone, said pre-amplifier having a passband of 20 Hz to 2 kHz used to condition acoustic data received from said contact microphone;

a variable amplifier operatively connected with said acoustic pre-amplifier for variably amplifying the conditioned acoustic data;

an electro-cardiogram (ECG) electrode;

an ECG amplifier operatively connected with said electro-cardiogram (ECG) electrode;

an analog to digital converter operatively connected with said variable amplifier and said ECG amplifier, said analog to digital converter for digitizing acoustic data and electro-cardiogram (ECG) data.

21. A method of optimizing a heart auscultation screening algorithm comprising:

applying a heart auscultation screening time-frequency transform algorithm to a set of data, wherein:

said algorithm includes wavelets and bandpass filters;

said data includes heart sounds known to be normal and heart sounds known to be pathologic;

said heart sounds being characterized by a systolic interval;

said systolic interval capable of being divided into systolic sub-intervals,

recording the results of said heart auscultation screening algorithm for a variety of time-frequency transform parameters and systolic sub-intervals; and

determining an optimal combination of wavelet scale parameter and systolic sub-interval for use with said heart auscultation screening wavelet algorithm based on sensitivity and specificity measurements.

22. A computer readable medium whose contents cause a computer based system to determine patient heart pathology by:

identifying a systolic sub-interval of a systolic interval for a plurality of heart cycles in a sequence of heart cycles;

computing an energy value for each systolic sub-interval;

computing a composite energy value using the computed energy values for each systolic sub-interval; and

comparing the composite energy value to a threshold level in order to distinguish between a normal heart and a pathologic heart.

23. A computer readable medium whose contents cause a computer based system to determine patient heart pathology by:

filtering a time series of heart sounds;

parsing the time series of heart sounds into a sequence of individual heart cycles;

identifying a systolic interval for each heart cycle;

identifying a systolic sub-interval of the systolic interval for each heart cycle;

computing an energy value for the systolic sub-interval of one or more heart cycles, said energy value being proportional to the energy level associated with the filtered series of heart sounds;

computing a composite energy value for the systolic sub-intervals of one or more heart cycles; and

comparing the composite energy value to a threshold level in order to distinguish between a normal heart and a pathologic heart.

24. A computer readable medium whose contents transform a computer based system into a heart pathology detection system, comprising:

a patient data collection subsystem for acquiring electro-cardiogram (ECG) and heart sound data from a patient;

a data management subsystem for managing electro-cardiogram (ECG) and heart sound data;

a data analysis subsystem for processing and analyzing electro-cardiogram (ECG) and heart sound data; and

a data storage subsystem for storing processed electro-cardiogram (ECG) and heart sound data.